

REMARKS

By this amendment, claims 1-3, 5-7, 10-11, and 13 have been amended. Accordingly, claims 1-18 are pending in the present application. The claim amendments are supported by the specification, the accompanying figures, and claims as originally filed, with no new matter being added. In addition, the word "single" in claim 6, line 4 has been deleted for reasons unrelated to patentability. In particular, the word was entered as a typographical error in the response to the Office Action dated August 29, 2001. *Compare* clean version of claim 6 on page 5 to marked up version of claim 6 on page 13. Accordingly, favorable reconsideration of the pending claims is respectfully requested.

1. Rejections Under the Judicially Created Doctrine of Double Patenting

Claims 1-5 have been rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-9 of U.S. Patent No. 6,107,686 to Sandhu et al. (hereinafter "Sandhu") for the reasons set forth on page 5 of the Office Action. Claims 6-18 have been rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-9 of *Sandhu* in view of U.S. Patent No. 5,708,303 to Jeng (hereinafter "Jeng '303") for the reasons set forth on pages 5-6 of the Office Action.

These rejections will be addressed when the Examiner has indicated allowable subject matter.

2. Rejections Under 35 U.S.C. §§ 103

Claims 1 and 3-5 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the Office Action. Applicants respectfully traverse.

Present claim 1 recites: a “single conductive material,” a “single first dielectric layer,” a “single second dielectric layer,” and a “single dielectric material.” Such a structure is illustrated in Figure 2 of the present application and is simpler, has less elements, and requires less fabrication than the structures taught by *Jeng* ‘303. In particular, *Jeng* ‘303 teaches a multiple layered metal line (58, 60, 62) as seen in Figure 18, where dielectric material 64 contacts each layer 60 and 62 but does not contact some portions 58. In contrast, Figure 2 of the present invention shows a metal line made of a single conductive material 16, where each metal line is contacted by each of the single first dielectric layer, the single second dielectric layer, and the single dielectric material. The claimed invention thus excels over the teachings of *Jeng* ‘303 by an inherently simpler, less expense structure that accomplishes the same result of reduced capacitance.

Applicant therefore respectfully asserts that claim 1 is patentable over *Jeng* ‘303. Claims 3-5 depend from claim 1 and are therefore patentable over *Jeng* ‘303 for at least the reasons presented hereinabove with respect to claim 1.

Claim 2 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Jeng* ‘303 and further in view of U.S. Patent No. 5,486,493 to *Jeng* (hereinafter “*Jeng* ‘493”) for the reasons set forth on pages 3-4 of the Office Action. Applicants respectfully traverse.

Claim 2 depends from claim 1 and thus includes the limitations thereof, including the specific limitations discussed hereinabove with respect to the rejections over *Jeng* ‘303. In addition to being absent from *Jeng* ‘303, such limitations are also not taught or suggested in *Jeng* ‘493. Thus, even if the cited references are combined as suggested by the Examiner, not all of the claim limitations are

met

over *Jeng* ‘303 for the reasons set forth on page 4 of the Office Action. APPENDIX - STATEMENT

traverse.

Present claim 6 recites: a "single first dielectric layer," a "single second dielectric layer," a "single dielectric material," "the upper surface of at least one line of said plurality of lines has thereon a layer of a refractory metal nitride," and "the lower surfaces of each plurality of lines is in contact with said upper surface of said single first dielectric layer." Such a structure is simpler, has less elements, and requires less fabrication than the structures taught by *Jeng* '303. In particular, *Jeng* '303 teaches a multiple layered metal line (58, 60, 62) as seen in Figure 18, where dielectric material 64 contacts each layer 60 and 62 but does not contact the lower surface of lead 58. *Jeng* '303 does not teach or suggest a structure wherein the conductive lines have a refractory metal nitride on the top surface but not on the bottom surface thereof. Thus, the presently recited structure of claim 6 provides a simpler design over *Jeng* '303 while continuing to provide the advantage of reduced capacitance.

Applicant therefore respectfully asserts that claim 6 is patentable over *Jeng* '303. Claims 7-9 and 11-13 depend from claim 6 and are therefore patentable over *Jeng* '303 for at least the reasons presented hereinabove with respect to claim 6.

In addition, claim 7 recites: "at least one side surface of the single dielectric material is in contact with at least one side surface of at least one of the plurality of lines." While the Examiner is correct that *Jeng* '303 discloses silicon dioxide liner 56, liner 56 is "conformally formed around the interconnect leads." Column 3, lines 23-24. Thus, *Jeng* '303 does not teach or suggest both "said layer of refractory metal nitride has an electrical insulation layer thereon" and "at least one side surface of the single dielectric material is in contact with at least one side surface of at least one of

side surface of the dielectric material 58.

Claims 14 and 16-18 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Jeng* '303 singly or in combination with U.S. Patent No. 6,087,250 to *Hyakutake* (hereinafter "*Hyakutake*") for the reasons set forth on pages 4-6 of the Office Action. Applicants respectfully traverse.

Claim 14 recites: "at least one side surface of the dielectric material is in contact with at least one side surface of at least one of the plurality of lines." While the Examiner is correct that *Jeng* '303 discloses silicon dioxide liner 56, liner 56 is "conformally formed around the interconnect leads." Column 3, lines 23-24. Thus, *Jeng* '303 does not teach or suggest both "said layer of refractory metal nitride has an electrical insulation layer thereon" and "at least one side surface of the dielectric material is in contact with at least one side surface of at least one of the plurality of lines" because liner 56 conformally covers both the refractory metal nitride and the side surface of the dielectric material 58.

Hyakutake does not overcome the foregoing deficiencies of *Jeng* '303. Applicant therefore respectfully asserts that claim 14 is patentable over *Jeng* '303 singly or combination with *Hyakutake*. Claims 16-18 depend from claim 14 and are therefore patentable over *Jeng* '303 singly or combination with *Hyakutake* for at least the reasons presented hereinabove with respect to claim 14.

Claims 10 and 15 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Jeng* '303 singly or in combination with *Hyakutake* and further in view of *Jeng* '493 for the reasons set forth on page 6 of the Office Action. Applicants respectfully traverse.

Claims 10, and 15 depend from claims 6, and 14, respectively, and thus include the limitations thereof, including the specific limitations discussed hereinabove with respect to the

taught or suggested in *Jeng* '493. Thus, even if the cited references are combined in any manner taught or suggested in *Jeng* '493.

the Examiner, not all of the claim limitations are met.

Claims 4, 12, and 17 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Jeng* '303 singly or in combination with *Hyakutake* and further in view of U.S. Patent No. 5,420,075 to Homma et al. (hereinafter "*Homma*") for the reasons set forth on page 6 of the Office Action. Applicants respectfully traverse.

Claims 4, 12, and 17 depend from claims 1, 6, and 14, respectively, and thus include the limitations thereof, including the limitations discussed hereinabove with respect to the rejections over *Jeng* '303. In addition to being absent from *Jeng* '303, such limitations are also not taught or suggested in *Hyakutake* or *Homma*. Thus, even if the cited references are combined as suggested by the Examiner, not all of the claim limitations are met.

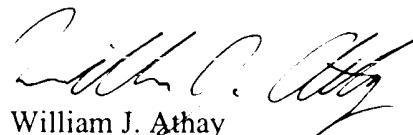
Accordingly, for at least the above reasons, claims 1-18 are not anticipated by or obvious over the cited references. Applicants therefore respectfully request that the rejections of the claims under 35 U.S.C. § 103(a) be withdrawn.

CONCLUSION

In view of the foregoing, Applicants respectfully request favorable reconsideration and allowance of the present claims. In the event the Examiner finds any remaining impediment to the prompt allowance of this application that could be clarified by a telephone interview, the Examiner is respectfully requested to contact the undersigned attorney.

Dated this 3rd day of September 2002.

Respectfully submitted,



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PATENT TRADEMARK OFFICE

VERSION WITH MARKINGS SHOWING THE CHANGES MADE
IN THE CLAIMS:

Claims 11-3, 5-7, 10-11, and 13 have been amended as follows:

1. (Twice Amended) An interlevel dielectric structure comprising:
a single first dielectric layer situated on a semiconductor substrate, said single first dielectric layer having an upper surface;
a plurality of lines comprised of a single conductive material extending along said upper surface of said single first dielectric layer, each line of said plurality of lines having upper and lower surfaces, and adjacent lines of said plurality of lines having spaces situated therebetween, the lower surfaces of each line of said plurality of lines being in contact with said upper surface of said single first dielectric layer;
a single second dielectric layer above both said plurality of lines and said single first dielectric layer, said single second dielectric layer having a lower surface in contact with the upper surface of each line of said plurality of lines; and
a single dielectric material situated in said space between adjacent lines of said plurality of lines, said single dielectric material not extending over the upper surface of each line of said plurality of lines, the upper surface of said single dielectric material being higher than the upper surface of each line of said plurality of lines, the lower surface of said single dielectric material being lower than the lower surface of each line of said plurality of lines.
2. (Once Amended) The interlevel dielectric structure as defined in Claim 1, wherein said single dielectric material comprises PTFE.
3. (Once Amended) The interlevel dielectric structure as defined in Claim 1, wherein at least one of the single first dielectric layer and single second dielectric layer [layers] comprises silicon dioxide.
5. (Once Amended) The interlevel dielectric structure as defined in Claim 1, where the single dielectric material has a dielectric constant of less than about 3.6.

6. (Twice Amended) An interlevel dielectric structure comprising:
a single first dielectric layer situated on a semiconductor substrate, said single first dielectric layer having an upper surface;
a plurality of lines comprised of a [single] conductive material extending along said upper surface of said single first dielectric layer; wherein:
each line of said plurality of lines has an upper surface, a lower surface, and at least one side surface;
adjacent lines of said plurality of lines have spaces situated therebetween;
the lower surfaces of each line of said plurality of lines is in contact with said upper surface of said single first dielectric layer; and
the upper surface of at least one line of said plurality of lines has thereon a layer of a refractory metal nitride;
a single second dielectric layer above both said plurality of lines and said single first dielectric layer, said single second dielectric layer having a lower surface in contact with the upper surface of each line of said plurality of lines; and
a single dielectric material situated in said space between adjacent lines of said plurality of lines, said single dielectric material not extending over the upper surface of each line of said plurality of lines, the upper surface of said single dielectric material being higher than the upper surface of each line of said plurality of lines, the lower surface of said single dielectric material being lower than the lower surface of each line of said plurality of lines.

7. (Twice Amended) The interlevel dielectric structure as defined in Claim 6, wherein:
said layer of refractory metal nitride has an electrical insulation layer thereon, said electrical insulation layer having thereon said single second dielectric layer; and
at least one side surface of the single dielectric material is in contact with at least one side surface of at least one of the plurality of lines.

10. (Once Amended) The interlevel dielectric structure as defined in Claim 6, wherein said single dielectric material comprises PTFE.

11. (Once Amended) The interlevel dielectric structure as defined in Claim 6, wherein at least one of the single first dielectric layer and single second dielectric layer [layers] comprises silicon dioxide.

13. (Once Amended) The interlevel dielectric structure as defined in Claim 6, where the single dielectric material has a dielectric constant of less than about 3.6.